CAMPBELL SCIENTIFIC
WHEN MEASUREMENTS MATTER

USER MANUAL

CS210
Enclosure
Humidity Sensor

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CSL 1007

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PLEASE READ FIRST

About this manual

Please note that this manual was originally produced by Campbell Scientific Inc. primarily for the North American market. Some spellings, weights and measures may reflect this origin.

Some useful conversion factors:

Area: 1 in^2 (square inch) = 645 mm^2

Length: 1 in. (inch) = 25.4 mm
1 ft (foot) = 304.8 mm
1 yard = 0.914 m
1 mile = 1.609 km

Mass: 1 oz. (ounce) = 28.35 g
1 lb (pound weight) = 0.454 kg

Pressure: 1 psi (lb/in^2) = 68.95 mb

Volume: 1 UK pint = 568.3 ml
1 UK gallon = 4.546 litres
1 US gallon = 3.785 litres

In addition, while most of the information in the manual is correct for all countries, certain information is specific to the North American market and so may not be applicable to European users.

Differences include the U.S standard external power supply details where some information (for example the AC transformer input voltage) will not be applicable for British/European use. *Please note, however, that when a power supply adapter is ordered it will be suitable for use in your country.*

Reference to some radio transmitters, digital cell phones and aerials may also not be applicable according to your locality.

Some brackets, shields and enclosure options, including wiring, are not sold as standard items in the European market; in some cases alternatives are offered. Details of the alternatives will be covered in separate manuals.

Part numbers prefixed with a "#" symbol are special order parts for use with non-EU variants or for special installations. Please quote the full part number with the # when ordering.

Recycling information

At the end of this product's life it should not be put in commercial or domestic refuse but sent for recycling. Any batteries contained within the product or used during the products life should be removed from the product and also be sent to an appropriate recycling facility.

Campbell Scientific Ltd can advise on the recycling of the equipment and in some cases arrange collection and the correct disposal of it, although charges may apply for some items or territories.

For further advice or support, please contact Campbell Scientific Ltd, or your local agent.

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CS210 Enclosure Humidity Sensor

1. General

The CS210 Enclosure Humidity sensor contains an Elan HM2000 series precision bulk-polymer relative humidity sensor. It is used to monitor the relative humidity inside an equipment enclosure deployed in the field.

NOTE The CS210 was once known as the #10162.

2. Specifications

Sensor: Elan HM2000 series precision bulk-polymer

Relative Humidity Measurement Range: 0 to 100% non-condensing

RH Output Signal Range: 0 to 1.0 VDC

Accuracy at 25°C
unspecified (0 to 10% Relative Humidity)
±3% RH (10 to 90% Relative Humidity)
unspecified (90 to 100% Relative Humidity)

Typical Long Term Stability: Better than 3% RH per year

Response Time (at 25°C, 90% response): 10 seconds for a 30% to 90% RH step change

Operating Temperature: 0°C to +50°C

Storage Temperature: -40°C to +80°C

Probe Length: 2.6 cm (1.02 in.)

Probe Cross Section Area: 0.6 cm x 1.1 cm (0.23 in. x 0.43 in.)

Current Consumption: <0.5 mA

Supply Voltage: 5 ± 0.25 VDC

Settling Time: 10 seconds

3. Installation

Mount the CS210 inside the environmental enclosure or onto a datalogger using the mounting block and the wire tie included with the sensor (Figure 1).

NOTE The black outer jacket of the cable is Santoprene® rubber. This compound was chosen for its resistance to temperature extremes, moisture, and UV degradation. However, this jacket will support combustion in air. It is rated as slow burning when tested according to U.L. 94 H.B. and will pass FMVSS302. Local fire codes may preclude its use inside buildings.

Figure 1. CS210 Installed on a CR1000

4. Wiring

Connections to Campbell Scientific dataloggers are given in Table 1 and Figure 2. The probe is measured by a single-ended analogue input channel.

Table 1. Datalogger Connections

Description	Colour	CR200-series	CR800, CR850, CR1000, CR3000, CR5000, CR9000(X), CR10(X), CR500, CR510, CR23X	21X
Relative Humidity	White	Single-Ended	Single-Ended Input	Single-Ended Input
Signal and Power Reference	Clear	G	G	⏚
Power	Black	C2	5 V	Control Port

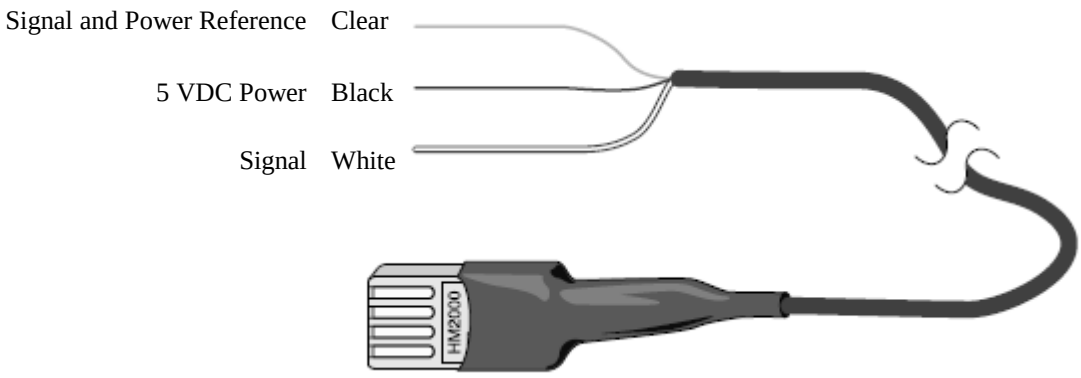

Figure 2. CS210 Wiring

5. Programming

This section is for users who write their own datalogger programs. A datalogger program to measure this sensor can be created using Campbell Scientific's Short Cut Program Builder Software. You do not need to read this section to use Short Cut.

The relative humidity signal from the CS210 is measured using a single-ended analogue measurement (CRBasic instruction SEVolt or Edlog Instruction 1). The CR200 series and 21X use a control port to power the CS210. At the beginning of the program, the control port needs to be turned on, and the port should remain on. It takes the CS210 approximately 10 seconds for the reading to become stable after the port has been turned on. Depending on the scan rate, the first few measurements from the CS210 could be low.

The probe output scale is 0 to 1000 millivolts for the relative humidity range of 0 to 100%. Table 2 provides calibration information for relative humidity.

Table 2. Calibration for Relative Humidity

Units	Multiplier (% mV^{-1})	Offset (%)
Per cent	0.1	0

5.1 CRBasic Examples

Example 1 is a sample CRBasic program written for a CR1000, but our CR800, CR850, CR3000, CR5000, and CR9000(X) dataloggers are programmed similarly.

Example 2 is a CRBasic program written for a CR200 datalogger. The CR200 program turns on control port 2 to power the CS210. Notice that the scan rate is set at 10 seconds. The sensor won't give a good reading until the second scan.

Example 1. Sample CR1000 Program

```
'CR1000 Series Datalogger

'SENSOR WIRING
'CS210
'Black: 5V
'White: SE1
'Clear: G

'Declare Public Variables
Public PanelTempC
Public Batt_Volt
Public Enc_RH
```

```
'Define Data Tables
DataTable (Daily,1,-1)
    DataInterval (0,1,Day,10)
    Minimum (1,Batt_Volt,FP2,0,False)
    Minimum (1,PanelTempC,FP2,False,False)
    Maximum (1,PanelTempC,FP2,False,False)
    Maximum (1,Enc_RH,FP2,False,False)
EndTable

'Main Program
BeginProg
    Scan (10,Sec,0,0)
        PanelTemp (PanelTempC,250)
        Battery (Batt_volt)
        'Measure CS210. Sensor is on all the time. Don't need a delay.
        VoltSe (Enc_RH,1,mV2500,1,1,0,250,0.1,0)
        'Set the sensor to 100% if it exceeds 100%.
        If Enc_RH > 100 Then Enc_RH = 100

        CallTable Daily
    NextScan
EndProg
```

Example 2. Sample CR200 Program

```
'CR200 Series Datalogger
'To create a different opening program template, type in new
'instructions and select Template | Save as Default Template
'date:
'program author:

'SENSOR WIRING
'CS210
'Black: C2
'White: SE1
'Clear: G

'Declare Public Variables
'Example:
Public batt_volt
Public Enc_RH

'Define Data Tables
DataTable (Daily,1,-1)
    DataInterval (0,24,hr)
    Minimum (1,batt_volt,0,0)
    Maximum (1,Enc_RH,False,0)
EndTable
```

```
'Main Program
BeginProg
    Scan (10,Sec)
        Battery (Batt_volt)

        'Power the CS210 using C2 and leave it on.
        PortSet (C2,1 )
        VoltSe (Enc_RH,1,1,0.1,0)
        'Set the sensor to 100% if it exceeds 100%.
        If Enc_RH > 100 Then Enc_RH = 100

        CallTable Daily
    NextScan
EndProg
```

5.2 Edlog Examples

Example 3 is a portion of a CR10(X) program, but our CR500, CR510, and CR23X dataloggers are programmed similarly. Wiring used for the CR10(X) program is included in Table 3.

Example 4 is an Edlog program written for a 21X Micrologger; wiring used for the 21X program is included in Table 3. The 21X program turns on control port 1 to power the CS210. Notice that the scan rate is set at 10 seconds. The sensor won't give a good reading until the second scan.

Table 3. Wiring for Examples 3 and 4

Description	Colour	CR10(X)	21X
Relative Humidity	White	SE 6 (3L)	SE 1 (1H)
Signal & Power Reference	Clear	G	G
Power	Black	5 VDC	C1

Example 3. Sample CR10(X) Program

```
;Measure the CS210 relative humidity.
;
01:  Volt (SE) (P1)
   1:   1              Reps
   2:   5              2500 mV Slow Range       ;CR510 (2500 mV); CR23X (1000 mV)
   3:   6              SE Channel               ;White wire (SE 6), Clear wire (G)
   4:   3              Loc [ RH_enc    ]
   5:   .1             Mult
   6:   0              Offset
```

Example 4. Sample 21X Program

```
;{21X}
;
*Table 1 Program
  01: 10            Execution Interval (seconds)

1: Batt Voltage (P10)
  1:  1             Loc [ Batt_Volt ]

2: Panel Temperature (P17)
  1:  2             Loc [ PnlTempC  ]

;Turn the CS210 on and leave it on.
;The CS210 needs approximately 10 seconds to stabilize. First scan will be low.

3: Do (P86)
  1:  41            Set Port 1 High

4: Volt (SE) (P1)
  1:  1             Reps
  2:  15            5000 mV Fast Range
  3:  1             SE Channel
  4:  3             Loc [ Enc_RH    ]
  5:  0.1           Multiplier
  6:  0             Offset

5: If time is (P92)
  1:  0             Minutes into a
  2:  1440          Minute Interval
  3:  10            Set Output Flag High

6: Set Active Storage Area (P80)
  1:  1             Final Storage
  2:  100           Array ID

7: Real Time (P77)
  1:  1220          Year,Day,Hour/Minute (midnight = 2400)

8: Minimum (P74)
  1:  1             Reps
  2:  0             Value Only
  3:  1             Loc [ Batt_Volt ]

9: Minimum (P74)
  1:  1             Reps
  2:  0             Value Only
  3:  2             Loc [ PnlTempC  ]

10: Maximum (P73)
  1:  1             Reps
  2:  0             Value Only
  3:  2             Loc [ PnlTempC  ]
```

```
11:  Maximum (P73)
   1:   1              Reps
   2:   0              Value Only
   3:   3              Loc [ Enc_RH    ]

*Table 2 Program
   02:  0.0000         Execution Interval (seconds)

*Table 3 Subroutines

End Program
```

6. Enclosure Humidity

Change the enclosure desiccant packs (model number #4905) when the enclosure relative humidity exceeds 40%.

Campbell Scientific recommends that all cable entry ports, that do not use a sealed bulkhead connector, be sealed with plumbers putty and that desiccant packs be placed inside the enclosure. Spikes in the enclosure humidity are a result of opening the enclosure door and allowing ambient air inside the enclosure. The enclosure relative humidity will return its nominal values (values before the enclosure door was opened) in approximately three to four hours.

7. Maintenance

The CS210 does not have any user serviceable parts nor does it require any routine maintenance.

Replace the CS210 probe every three to five years of continuous use. If the probe fails, replace it with a new one.

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